

# Effect of PCOS on Glucose Metabolism

Amruta Bennal<sup>1</sup>, Sudha Kerure<sup>2</sup>

<sup>1</sup> Department of Physiology,  
Navodaya Medical College,  
Raichur, Karnataka, India

<sup>2</sup> Department of Obstetrics &  
Gynaecology, Navodaya Medical  
College, Raichur, Karnataka, India

**Correspondence to:**

Amruta Bennal  
(amrutabennal@gmail.com)

**Received: 28.02.2013**

**Accepted: 22.04.2013**

DOI: 10.5455/njppp.2013.3.  
220420132

## ABSTRACT

**Background:** Polycystic ovarian syndrome (PCOS) is one of the most common endocrine problems in women of reproductive age, which is multifactorial in etiology. It is associated with menstrual dysfunction and subfertility. The menstrual dysfunction that occurs with PCOS arises from anovulation or oligo-ovulation. It causes amenorrhea to oligomenorrhea. Hyperinsulinemia and insulin resistance are commonly associated with PCOS. So our study includes estimating FBS and PPBS (2 hour after OGTT) in PCOS patients to know about glucose metabolism in PCOS.

**Aims & Objective:** To know the effect of PCOS on glucose metabolism in younger age group.

**Materials and Methods:** A case control study was conducted in 50 PCOS patients (15 to 25 years age) and 50 normal menstruating women, matched for age and anthropometric data. Statistical analysis was done by using student 't' test.

**Results:** FBS (Fasting Blood Sugar) and PPBS (Postprandial Blood Sugar) after 2 hour OGTT were significantly raised in PCOS patients compared to normal menstruating women.

**Conclusion:** PCOS patients are more prone for impaired glucose tolerance and type 2 Diabetes Mellitus. So they should screen for impaired glucose tolerance and type 2 Diabetes Mellitus to prevent complications.

**KEY WORDS:** Polycystic Ovarian Syndrome; Fasting Blood Sugar; Postprandial Blood Sugar

## INTRODUCTION

Polycystic ovarian syndrome (PCOS) is one of the most common endocrine problems in women of reproductive age, which is multifactorial in etiology. PCOS includes a heterogeneous collection of signs and symptoms with varying degree of mildness and severity in affecting the reproductive, endocrine and metabolic functions.

Previously, Polycystic ovary syndrome was the most-common endocrinopathies of premenopausal women, with a prevalence estimated at approximately 5 percent of this population.<sup>[1]</sup> Nowadays, 1% to 5% of female population with 15 to 25 years suffer from PCOS<sup>[2]</sup> because of its association with menstrual dysfunction<sup>[3]</sup> and subfertility<sup>[3,4]</sup>.

The menstrual dysfunction that occurs with PCOS arises from anovulation or oligo-ovulation. It causes amenorrhea to oligomenorrhea. PCOS is common cause for hyperandrogenism and hirsutism and associated with increased risk of impaired glucose tolerance and type 2 diabetes.<sup>[5]</sup> Hyperinsulinemia<sup>[6,7]</sup> and insulin resistance<sup>[6]</sup> are commonly associated with PCOS. Insulin resistance is now recognized as a major risk factor for development of hyperglycemia and type 2 diabetes mellitus.<sup>[6]</sup>

There are many studies done to know the prevalence of impaired glucose tolerance and type 2 diabetes mellitus in women with PCOS in reproductive age and in western countries, but there are few studies done in younger age group with PCOS. So we have taken this study to know the effect of PCOS on glucose metabolism in younger age group.

## MATERIALS AND METHODS

This study was conducted in the Department of Physiology, Navodaya Medical College (NMC) Raichur, with the help of OB/GYN Department, NMC Raichur and with the assistance of laboratory setup of the Department of Biochemistry, NMC Raichur. The study and its

conduct were cleared by the ethical committee, NMC Raichur.

The study was done by obtaining blood samples from study group and controls, attending OPD, in OB/GYN Department, NMC Raichur, during study period (June 2012 – January 2013). The study group consisted of 50 PCOS patients, diagnosed by history and ultrasonographic finding, with age group 15 to 25 years, attending the OPD of OB/GYN Department, NMC Raichur. 50 normal menstruating women were taken as controls.

Previous history of hypertension, Diabetes Mellitus, renal disease, thyroid disorder dyslipidemia any disease affecting blood glucose level were excluded from study. Subjects with family history of diabetes mellitus were excluded from study. After selecting the subjects and controls, informed consent was taken. Height and weight of the individuals were measured. BMI was calculated as per formula:

$$BMI \text{ (Quetelet's Index)} = \frac{\text{Height (kg)}}{\text{Height (m)}^2}$$

The subjects and controls were examined for vital signs, Pulse, Blood pressure. All vital parameters were within normal physiological limit. After giving proper instructions, subjects and controls underwent OGTT (oral glucose tolerance test) with 75 gram of glucose. 2 ml of fasting blood sample was collected venipuncture under aseptic precaution for fasting blood sugar (FBS). 75 gram of glucose was given with 300ml of water to drink. After 2 hours, blood sample was collected by venipuncture under aseptic precaution, for post prandial blood sugar (PPBS). Sample was analyzed in Biochemistry Lab, in NMC Raichur, with clinical chemistry Analyzer. Analysis was done for fasting blood sugar (FBS) and post prandial blood sugar (PPBS)

### Statistical Analysis

The results were expressed in terms of mean  $\pm$  SD. The test of significance used was student 't' test and a p value less than 0.05 was considered statistically significant.

## RESULTS

A case –control study of 50 PCOS patients and regular menstruating women was undertaken. The age, BMI, FBS and PPBS of study and control group is represented in table. There is no statistical difference in age and BMI of study and control group. In PCOS patients, FBS and PPBS is more comparing to controls. There is high statistical significant difference in FBS and PPBS among cases and controls. 5 cases (10%) of PCOS have FBS more than normal and 4 cases (8 %) of PCOS have impaired glucose tolerance after 2 hours OGTT.

**Table-1: Anthropometric Data of PCOS Patients and Controls**

Parameter	Group (Mean ± SD)		't' value	'p' value
	Study	Control		
Age (Years)	19.04 ± 0.57	18.86 ± 0.57	0.121	> 0.05*
BMI (kg/m <sup>2</sup> )	21.46 ± 0.76	21.48 ± 0.81	0.124	> 0.05*

\* Not Significant

**Table-2: FBS and PPBS in PCOS Patients and Controls**

Parameter	Group (Mean ± SD)		't' value	'p' value
	Study	Control		
FBS (mg/dl)	91.10±6.27	86.36±6.77	3.630	<0.001*
PPBS (mg/dl)	127.66±9.9	119.90±6.73	4.555	<0.001*

\* Highly Significant

**Table-3: Actual number and % of PCOS and Controls with FBS and PPBS Parameters**

Parameter	PCOS Patients N (%)	Controls N (%)
FBS < 100mg/dl	45 (90%)	50 (100%)
FBS - 100 to 125 mg/dl	5 (10%)	0
FBS > 126 mg/dl	0	0
PPBS < 140 mg/dl	46 (92%)	50 (100%)
PPBS - 140 to 199 mg/dl	4 (8%)	0
PPBS > 200 mg/dl	0	0

## DISCUSSION

The study was conducted to evaluate changes for fasting blood sugar (FBS) and post prandial blood sugar (PPBS) in polycystic ovarian syndrome (PCOS) and normal menstruating women. Polycystic ovarian syndrome is one of the important endocrine disorder causing reproductive abnormalities in women, which has heterogeneous clinical features and multifactorial in etiology.<sup>[8]</sup> Patients with PCOS are at increased of glucose intolerance and frank type 2 Diabetes Mellitus early in life. In our study, we have noticed, 10% of PCOS patients have

Fasting blood sugar more than 100 mg/dl and 8 % of cases have PPBS ( after 2 hour OGTT) more than and equal to 140 mg/dl. As PCOS patients commonly exhibit insulin resistance, resulting in hyperinsulinemia, leading to the development of hyperglycemia and type 2 Diabetes Mellitus. The probable cause for hyperinsulinemia is increased basal insulin secretion and decreased hepatic insulin clearance.<sup>[9]</sup> In both non-obese and obese PCOS women, insulin secretion is inappropriately low for their degree of insulin resistance, suggesting the presence of pancreatic P-cell dysfunction in these patients.<sup>[10,11]</sup> Ehrmann and colleagues have demonstrated decreased postprandial insulin secretory responses as well as abnormalities in entrainment of insulin secretion to an oscillatory glucose infusion in PCOS women, consistent with P-cell dysfunction.<sup>[10]</sup> P-cell dysfunction can precede glucose intolerance in PCOS.<sup>[11]</sup>

Insulin resistance plays a role in the pathogenesis of the reproductive abnormalities characteristic of PCOS. Insulin resistance and hyperinsulinemia may affect ovarian steroidal hormone synthesis. A specific defect in early steps of insulin receptor mediated signaling (diminished autophosphorylation) has been identified in 50% of women with PCOC.<sup>[12]</sup>

As women with PCOS are more prone for glucose intolerance and type 2 Diabetes Mellitus early in life, these women should be tested for glucose intolerance to reduce the risk of cardiovascular disease. The frequency for testing depends on age, BMI, and waist circumference which increases the risk. So that, the women with PCOS should periodically have an OGTT and must be closely monitored for deterioration in glucose tolerance. Androgen Excess Society of Virginia, prescribes, Patients with normal glucose tolerance should be rescreened at least once every 2 year, or more frequently if additional risk factors are identified. Those with IGT should be screened annually for development of type 2 Diabetes Mellitus.<sup>[13]</sup> PCOS patients with IGT should be treated with intensive lifestyle modification and weight loss and considered for treatment with insulin-sensitizing agents.

## CONCLUSION

PCOS patients are more prone for impaired glucose tolerance and type 2 Diabetes Mellitus. So they should screen for impaired glucose tolerance and type 2 Diabetes Mellitus to prevent complications.

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**Cite this article as:** Bennal AS, Kerure SB. Effect of PCOS on glucose metabolism. *Natl J Physiol Pharm Pharmacol* 2013; 3:167-170.

**Source of Support:** Nil

**Conflict of interest:** None declared